

Leaflet No 15 September 2002

Radio VNG: Australia's Standard Frequency and Time Signal Service

Introduction

Radio VNG is Australia's standard frequency and time signal service. For many years people and organisations throughout Australia have made use of the timing signals broadcast by Radio VNG. These timing signals may be used for purposes such as surveying, geophysics and navigation. Radio VNG users include seismologists, astronomers, upper atmosphere physicists, surveyors, geophysicists studying the Earth's magnetic field and amateur radio operators. This service forms part of Australia's technological infrastructure by providing a signal of moderate accuracy (1 millisecond) that can be readily accessed with relatively inexpensive equipment. It is also used to confirm any ambiguities inherent in more precise methods of time comparison.



Background

For approximately 23 years, Radio VNG was broadcast from Lyndhurst, Victoria. It was funded by Telstra (formerly Telecom Australia) and the monitoring and research were conducted by their research laboratories at Clayton, Victoria.

In late 1986 the Precise Time Working Group (now the National Time Committee), under the auspices of the Commission, learned of the impending closure of Radio VNG and conducted a survey to ascertain the usage of the service and the scientific and economic impact of its closure. The survey results showed that there was extensive and diverse usage of the service throughout the community; usage which, by the very nature of its application, was difficult to quantify economically.

Following the closure of Radio VNG in October 1987, the Commission convened a seminar to investigate what provisions needed to be made for an intermediate accuracy time service and to consider the extent to which the provisions for high accuracy time comparisons were meeting Australia's needs.

Several alternatives to Radio VNG were discussed but each was found to have significant disadvantages in terms of accessibility and cost compared with Radio VNG's time service. It was recommended by the many participants at the meeting that Radio VNG be reinstated; that the service be recognised as part of Australia's technological infrastructure and be funded by the Federal Government. At this time no single department or authority was identified to fund the operation of Radio VNG.

VNG Users Consortium

The VNG Users Consortium was formed to reestablish Radio VNG and to collect donations from former users to dismantle, pack and transfer the transmitting equipment to a new location.

More than \$10 000 was raised and the equipment was relocated to AirServices Australia's (formerly the Civil Aviation Authority) International Transmitting Station in Llandilo, NSW. The Australian Surveying and Land Information Group (AUSLIG, now known as the National Mapping Division, Geoscience Australia), agreed to finance the operation of Radio VNG on a partial cost recovery basis from users. Initially, there were both technical and licensing problems, all of which have since been resolved.

Further details of the VNG Users Consortium are given in Appendix I.

The Present Situation

As part of its responsibility of coordinating the national measurement system, the Commission took over the funding of Radio VNG in November 1992 and on 12 January 1993 became the owner of the transmitting licence. The Commission also administers the National Measurement Act 1960 and the Regulations empowered under it. These Regulations define the units of measurement used for legal purposes in Australia, including the units of measurement for time.

Currently, the Commission funds AirServices Australia to operate and maintain Radio VNG. The Commission also funds CSIRO to monitor the accuracy of the Radio VNG transmissions and carry out other functions related to the national time system and Coordinated Universal Time (UTC). The most recent improvements to the Radio VNG time service were the addition of a talking clock that went to air on 15 January 1992, and a 1 kW 2.5 MHz transmission which began on 7 October 1992, to improve reception in the Sydney metropolitan region. Additional transmitters have also been acquired to provide backup to the existing system. A digital voice announcing machine, with no moving parts replaced the less reliable tape cartridge machines in early 1994.

Further technical details of the operation of Radio VNG are given in Appendix II. Details of the binary coded decimal (BCD) time code format which incorporates time of day and the day number in the year are given in Appendix III.

Radio VNG will to cease to operate from 31 December 2002.

Further Information

The following information leaflets also contain information related to this topic:

- No 8 The Australian National Time System
- No 27 Daylight Saving
- No 28 Calendars
- No 32 Leap Seconds

Appendix I VNG Users Consortium

The VNG Users Consortium was formed as a subcommittee of the Precise Time Working Group (now the National Time Committee) of the Commission because of users dismay at the closure of Radio VNG in October 1987. The objective of the Consortium was to reestablish and maintain a national high frequency standard frequency and time signal service.

At their inaugural meeting on 25 February 1988 the organisers wrote to all known Radio VNG users requesting contributions towards the cost of acquiring the Radio VNG plant and reinstating the service. The response was heart warming. Private individuals (many of whom were not paid for the activities for which they used Radio VNG) contributed up to \$100 out of their own pockets, and some organisations contributed up to \$2000 to try to save this national facility. This enabled the VNG Users Consortium to pay for the relocation of Radio VNG from Clayton in Victoria to what was then the Civil Aviation Authority's International Transmitting Station at Llandilo, NSW, in June 1988.

As a result of users being willing to contribute money to save the service, AUSLIG (now known as the National Mapping Division, Geoscience Australia) agreed to meet the costs of setting up at Llandilo and to cover the running costs on a partial recovery basis from users. The role of the VNG Users Consortium was to raise some of this money, to represent users interests to various Government bodies. to answer queries, and to verify reception reports (QSLs). The Consortium also negotiated with the Department of Transport and Communications and the Royal Australian Navy for extra frequencies for Radio VNG, as its old ones were now in the wrong part of the radio frequency spectrum.

As a result of protracted efforts over several years, Radio VNG now transmits on five frequencies instead of the original three! Other contributions by the Consortium include provision of station identification announcements, the addition of a talking clock, and the purchase of the first 2.5 MHz transmitter and a new AWA digital announcing machine.

The Commission took over the recurrent funding of Radio VNG on a non-cost recovery basis in 1992. This has taken much of the burden off Consortium volunteers, who have always done their work unpaid in their own time. The Commission now issues most of the QSLs, though the VNG Users Consortium also answers queries where appropriate. The Consortium still provides the voice announcements and represents users interests to the Commission through its National Time Committee.

The VNG Users Consortium is eager to continue to collect financial contributions for contingencies and to enable them to have the means to promote Radio VNG's importance to the Government in the event that its continued operation again comes into question. After all, Radio VNG would have been history if people had not been prepared to dig into their own pockets. Money is a powerful way of showing that we really do care! If you would like to help, or if you would like any further information on the VNG Users Consortium please contact

Dr Marion Leiba Honorary Secretary VNG Users Consortium GPO Box 1090 Canberra, ACT 2601 Tel: (61 2) 6231 9476 (home)

Appendix II Radio VNG Technical Details

Location

Radio VNG is broadcast from the AirServices Australia, International Transmitting Station, located at Llandilo, NSW, position 33°42'52"S, 150°47'33"E.

Transmitters

The service employs STC double sideband, full carrier AM, HF broadcast transmitters. The 2.5 MHz service uses a STC 4SU55A/S transmitter whilst the 5 MHz, 8.638 MHz, 12.984 MHz and 16 MHz services employ STC 4SU48B transmitters.

Frequencies, Power and Emission Mode

The transmitter frequencies, powers and transmission modes are:

2.5 MHz	1 kW, emission mode to be
	advised
5 MHz	10 kW, emission mode
	6K00B9W
8.638 MHz	10 kW, emission mode
	3K00A1A
12.984 MHz	10 kW, emission mode
	3K00A1A
16 MHz:	5 kW, emission mode
	6K00B9W
NI (0 (20)	

Note: 8.638 MHz and 12.984 MHz are frequencies on loan from the Royal Australian Navy.

Antennae

monopole (vertical antenna)
Wells quadrant antenna
delta-matched quadrant antenna
with a single wire per arm
delta-matched quadrant antenna
with a single wire per arm
delta-matched quadrant antenna
with a single wire per arm

Transmission Schedule

continuous
continuous
continuous
continuous
2200-1000 UTC

Voice Station Identification Announcement

This is provided on the 2.5 MHz, 5 MHz and 16 MHz services only using an AWA digital voice recorder. It is given during the 15th, 30th, 45th and 60th minutes without interruption to the time signal. The speech is 'notched' to allow seconds markers to continue and has spectral components around 1000 Hz removed to avoid erroneous operation of tuned relay time circuits.

Morse Station Identification

This is provided on the 8.638 MHz and 12.984 MHz frequencies only. It is given during the 15th, 30th, 45th and 60th minutes without interruption to the time signals. VNG is transmitted in slow morse at a frequency of approximately 400 Hz up to six times per minute. Broken idents may occur at the beginning and end of the minute.

Reception Reports

All correspondence, including reception report and requests for reception reports (QSLs), should be addressed to:

Radio VNG National Standards Commission PO Box 282 North Ryde, NSW 1670

The reports should be sufficiently detailed to permit verification. Return postage, preferably in the form of an International Reply Coupon (or US\$1) would be appreciated from other than VNG Users Consortium members.

Talking Clock

This gives Coordinated Universal Time as UTC(ATC) each minute, immediately after the minute marker. It operates on 2.5 MHz, 5 MHz and 16 MHz services only.

Time Delay Through Transmitters

The timing of Radio VNG time signal pips is done prior to transmission. Users who wish to obtain the greatest accuracy could benefit by taking into account the delays introduced by the transmitters. The time delay for the 5 MHz, 8.638 MHz, 12.984 MHz and 16 MHz services is 190 μ s. The delay associated with the 2.5 MHz is to be advised.

Accuracy and Traceability

The time and frequency information broadcast by Radio VNG is traceable to the standards maintained by the Telstra Research Laboratories at Clayton, Victoria. The carrier frequencies and 1 kHz tone broadcast by Radio VNG are within 1 part in 10¹¹ of Telstra's frequency standard (24 hour average value).

The time interval information has the same accuracy as the carrier frequencies except for intervals which are subject to routine step adjustments. The time of day information is maintained within 100 μ s of UTC(ATC) and is typically within 10 μ s of UTC(ATC). In turn UTC(ATC) is within approximately 50 μ s of UTC.

Unfortunately due to effects such as ionospheric jitter the accuracy of the frequency information received from the Radio VNG broadcasts may be degraded to around 1 part in 10^7 . The time signal accuracy is typically of the order of 1 millisecond.

Appendix III Radio VNG Time Code Format

